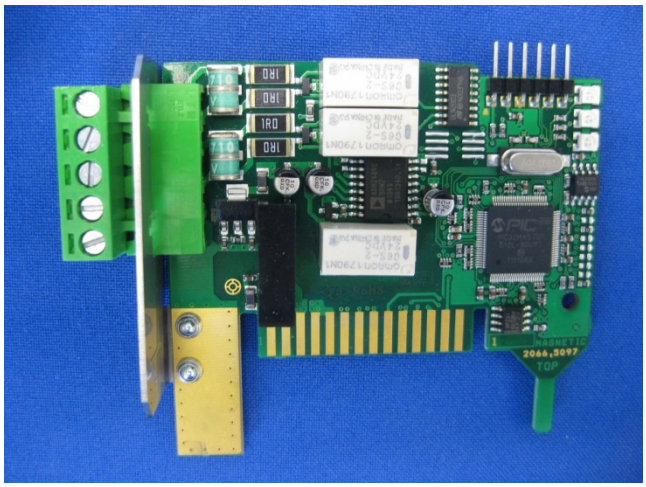
MAGNETIC AUTOCONTROL™

Technical Manual

RS485/422
MGC-PRO MicroDrive



This technical manual is a supplement to the operating instructions "Barrier MHTM™ MicroDrive" (5815,5001) and describes the RS485/422 module.

Before using the RS485/422 module, read this handbook and the operating instructions "Barrier MHTM™ MicroDrive" carefully!

Doc-ID: 5815,0003EN

Version: 00

MAGNETIC Autocontrol GmbH
Grienmatt 20
79650 Schopfheim
Germany

Phone: +49 (0) 7622 695 5
Fax.: +49 (0)7622 695 602
Email: info@ac-magnetic.com
Internet: www.ac-magnetic.com

Contents

Contents

1 General

1.1 Information regarding the technical manual

This manual offers important information on handling of the RS485/422 module. The RS485/422 module can only be operated installed in the MAGNETIC MHTM^{TM} MicroDrive barriers.

Prerequisite for secure work is compliance with all indicated safety notes, warning notes and instructions in this manual and in the operating instructions "Barrier MHTM^{TM} MicroDrive" (5815,5001). For better overview, the safety notes and warnings of the operating instructions "Barrier MHTM^{TM} MicroDrive" are not repeated.

Before using the RS485/422 module, read this handbook and the operating instructions "Barrier MHTM^{TM} MicroDrive" carefully!

NOTE!

This technical manual is valid as of the following firmware version:

4915,3007 – v0.1

1.2 Function

The RS485/422 module can be used to parameterise and control the MAGNETIC MHTM^{TM} MicroDrive barrier via Modbus.

1.3 Reference documents

NOTE!

This technical manual is based on the documents listed in the following table.

All listed reference documents are available free of charge via the indicated procurement source.

Number	Title	Author	Procurement source
5815,5001	Operating instructions "Barrier MHTM™ MicroDrive"	MAGNETIC Autocontrol GmbH	info@ac-magnetic.com
5815,0000	MicroDrive MGC/MGC-PRO Additional Information for System integrators	MAGNETIC Autocontrol GmbH	info@ac-magnetic.com
CIA309-1 CIA309-2	Interfacing CANopen with TCP/IP	© CAN in Automation (CiA) e. V.	www.can-via.org
–	MODBUS APPLICATION PROTOCOL SPECIFICATION	Modbus-IDA	www.Modbus-IDA.org
–	Modbus Messaging Implementation Guide	Modbus-IDA	www.Modbus-IDA.org

Table 1: Reference documents

1.4 Pictogram explanation

Warning Notes

Warning notes are characterised by pictograms in this manual. It is absolutely essential to observe the notes and to proceed with caution in order to prevent property damage.

NOTICE!	
	**NOTICE!** … points to a potentially harmful situation, which can lead to property damage if it is not avoided.

Hints and recommendations

NOTE!

… highlights useful hints and recommendations as well as information for an efficient and trouble-free operation.

1.5 Intended use

The plug-in module "RS485/422" is exclusively intended for expansion of the MGC-PRO control devices by the function "RS485/422". The plug-in module can only be operated installed in the MAGNETIC MHTM^{TM} MicroDrive barriers. This plug-in module can be used to parameterise and control the MAGNETIC MHTM^{TM} MicroDrive barrier via Modbus.

Installation, connection and commissioning of the RS485/422 module and operation via the RS485/422 module must only be performed by specialists.

Any types of claims due to damage arising from improper use are excluded. The operator alone shall be responsible for any damage arising from improper use.

NOTE!

→ For any further information on the barrier MHTM^{TM} MicroDrive, see operating instructions.
See page 6, chapter 1.3. "Reference documents".

2 Technical data

Designation	Unit	Value
Current consumption	mA	50
Max. line length:	m	1000
Cable type	–	2x2 (twisted), shielded
Plug type	–	Spring clip max. 2.5mm²
Supported services	–	MODBUS

Table 2: Technical data

3 Installation and network connection

3.1 RS485/422 Installing module in control unit MGC-PRO

Hints and recommendations

NOTE!

The RS485/422 module can only be operated with the MAGNETIC control units MGC-PRO.

The RS485/422 module is installed and set in the factory. Observe the following safety note in case of retrofitting by the customer.

RS485/422 Module retrofitting

NOTICE!

NOTICE!
Property damage from improper installation and improper commissioning.

Therefore:

– Only qualified staff must install the RS485/422 module, connect and commission it.
– Take ESD precautions and comply with them.

1. Open barrier casing according to operating instructions "Barrier MHTM™ MicroDrive". Observe warning notes.
2. Switch off power supply. Ensure that the system is powered down. Secure against reactivation. The balancing springs in the lever system are relaxed.
3. Take care when opening control unit cover.
4. Plug in plug-in module in a free slot.

NOTE!

Slot selection influences the plug-in module's module address. *→ See page 17, chapter 4.2.2.*

5. Switch on power supply.
6. Check LEDs at the plug-in module. The green LED at the centre must be lit. → If applicable, read the following chapter "Corrective action".
7. The main menu shows the menu "RS485/422".
8. Apply cover of the control unit.
9. Close barrier casing according to operating instructions "Barrier MHTM™ MicroDrive".

3.1.1 Corrective action

Malfunction	Possible cause	Corrective action
Green LED at the centre is not permanently lit.	The RS485/422 module is only supported by the control units MGC-PRO.	Check label or type sign of the control unit.
	The RS485/422 module is not plugged in correctly.	Check plug contacts. Plug in the RS485/422 module again.
Green LED at the centre is not lit.	Firmware update not performed correctly.	Perform firmware update via the service module SM01.

Table 3: Corrective action

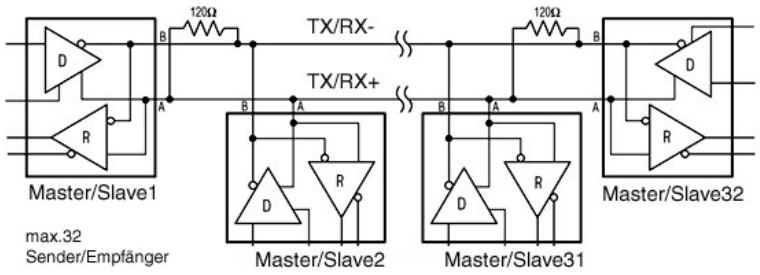
3.2 Perform network connection

Connect the barrier to your RS485/422 devices with a suitable cable. The clamp assignment is printed on the module's plug.

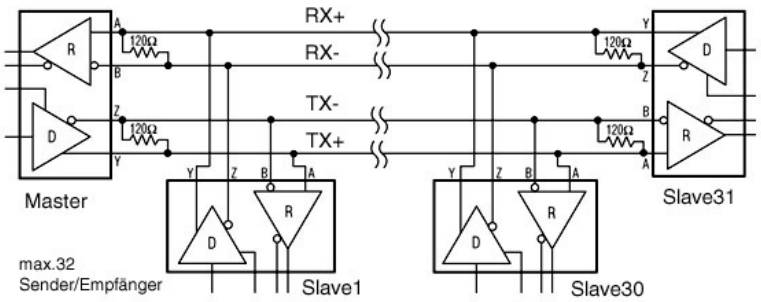
Y – Z – B – A – 0V

3.3 RS-485 bus

3.3.1 2-wire (half-duplex)



3.3.2 4-wire (full-duplex)



3.4 Address settings

The subscriber address is set comfortably using the operating display of the MGC-PRO control unit.

When setting the address, observe that the addresses of the different subscribers in the RS485 network differ.

3.5 Menu "RS485/422" of the control unit MGC-PRO

Once the RS485/422 module is plugged in and the control unit supplied with power, the menu "RS485/422" appears in the main menu.

The position of the menu "RS485/422" in the main menu depends on the other plug-in modules installed and the slot used.

Operating view → Main menu → RS485/422	
Parameters	**Description**
Settings	Display and setting of the network settings
Information	Displays information via the RS485/422 module. The serial number, hardware version, software number and software version of the RS485/422 module are displayed.

Table 4: Menu "RS485/422"

Operating view → Main menu → RS485/422 → Settings	
Parameters	**Description**
Address	The settings and display of the address of the bus participant. **Factory setting** ■ 1
Termination	Activation/deactivation of the bus termination. When this function is activated, the resistor is added via a relay. **Factory setting** ■ OFF
Baudrate	Setting the baudrate **Factory setting** ■ 19200
Parity	Setting the parity **Factory setting** ■ even
Bus-Type	Setting the bus design. Choose between the settings 2-wire (half-duplex) and 4-wire (full-duplex). **Factory setting** ■ 2-Wire
BIAS	Activation/deactivation of the BIAS network resistors. When transmitting/receiving via a core pair, undefined line conditions may be prevented by adding BIAS resistors. When this function is activated, the resistor is added via a relay. **Factory setting** ■ OFF

Table 5: Menu "Settings"

4 Modbus interface

4.1 Standard Modbus

Communication takes place via the Modbus protocol.

After the connection between the client (master) and server (slave) is established, the master sends Modbus requests to the server. The result is returned as a Modbus response.

The PDU (Protocol Data Unit) defined in the Modbus protocol is independent of the underlying communication layer. The PDU consists of "Function Code" and "Data". The Modbus ADU (Application Data Unit) for "Modbus via the serial interface“ comprises the address field, the PDU and a postfix checksum (16 bit CRC).

The "Function Code" of the message determines the Modbus service to be performed. Depending on "Function Code", "Data" includes additional information.

NOTE!

→ For more information on the Modbus specifications, see reference document "Modbus Application Protocol Specification", page 6, chapter 1.3.

4.1.1 Function codes

MicroDrive RS485/422 supports the following "Function Codes":

Function Code	Function
03	Access via Modbus address table
04	
06	
16	
43/13	Expanded parameter access (MEI subcode CANopen)

Table 6: Function Codes

4.1.2 Address table

The following Modbus address table permits access to the most important functions and conditions of the barrier.

For this, the "Function Codes" 0x3 to 0x6 are used. → See page 6, chapter 1.3 "Reference documents".

Address	Name	Data type	Area	Access	Description
0000	BarControl	16Bit	0 … 4	RW	Barrier commands: 0000 – delete commands 0001 – open 0002 – close 0004[1] – opening high priority
0001	Status	32Bit		RO	Barrier status word
0003	Inputs	16Bit		RO	Conditions of the inputs of the MGC-PRO control unit
0004	Outputs	16Bit		RO	Conditions of the outputs of the MGC-PRO control unit
0005	Loop A	16Bit		RO	Status loop A
0006	Loop B	16Bit		RO	Status loop B
0007	Loop C	16Bit		RO	Status loop C
0008	Loop D	16Bit		RO	Status loop D

Table 7: Address table

[1]The command "Opening high priority" is not self-resetting. This must be explicitly deleted using (0000 – Delete commands).

4.1.3 Examples

Reading status – request

Meaning		Value (hex)
ADU	Address	01
PDU	Function Code (Read Holding Register)	03
	Starting Address	00
		01
	Quantity of Register	00
		02
ADU	CRC-16	95
		CB

Reading status – response

Meaning		Value (hex)
ADU	Address	01
PDU	Function Code (Read Holding Register)	03
	Byte Count	04
	Register Value HiHi	00
	Register Value HiLo	10
	Register Value LoHi	02
	Register Value LoLo	01
ADU	CRC-16	3B
		56

Table 8: Example “Reading status”, request and response

Closing barrier – request

Meaning		Value
ADU	Address	01
PDU	Function Code (Write Single Register)	06
	Register Address	00
		00
	Register Value	00
		02
ADU	CRC-16	08
		0B

Closing barrier – response

Meaning		Value
ADU	Address	01
PDU	Function Code (Write Single Register)	06
	Register Address	00
		00
	Register Value	00
		02
ADU	CRC-16	08
		0B

Table 9: Example "Closing barrier", request and response

Opening barrier – request

Meaning		Value
ADU	Address	01
PDU	Function Code (Write Single Register)	06
	Register Address	00
		00
	Register Value	00
		01
ADU	CRC-16	48
		0A

Opening barrier – response

Meaning		Value
ADU	Address	01
PDU	Function Code (Write Single Register)	06
	Register Address	00
		00
	Register Value	00
		02
ADU	CRC-16	48
		0A

Table 10: Example "Opening barrier", request and response

4.2 Expanded access via Modbus "Function Code 43/13"

4.2.1 CANopen TCP/IP Interface

In addition to the control via standard Modbus, access to further parameters is possible via "Function Code 43/13". → See page 6, chapter 1.3 "Reference documents", document "Interfacing CANopen with TCP/IP". You may read and set the parameters of the control unit and all inserted plug-in modules via the expanded access.

4.2.2 Module addresses

The MGC-PRO control unit is modularly built. Every plug-in module has a unique basic address. The module address is the sum of the basic address and slot number. This enables operation of several equal plug-in modules like two detector modules in the same control unit.

Basic address	Module
0x01	MGC logic and motor control
0x02	
0x09	Detector module
0x18	Radio module
0x20	Ethernet Module
0x28	RS485/422 module

Table 11: Module addresses

The RS485/422 modules thus can have the addresses 0x28 to 0x2F. To be able to access parameters of the RS485/422 module, the module address must be known.

4.2.3 Supported commands

NOTE!

For more information, refer to reference document "CIA309-1/ -2, Interfacing CANopen with TCP/IP".
→ See page 6, chapter 1.3 "Reference documents".

The RS485/422 module supports only the SDO commands defined in document CiA DS 309, section 4.1.

- Simple transfer
- Default network number
- Default data type of the protocol
  → Refer to CiA DS 309-2, 3.2.3.4.2 Protocol control.

4.2.4 Examples

Reading cycle counter – request

Meaning				Value
ADU		Address		01
PDU		Function Code (encapsulated interface)		2B
		MEI Type “CANopen"		0D
	CAN CiA DS309	Protocol Option Fields	Protocol Control	00
			Reserved Field	00
		Node ID		01
		Index	Hi	21
			Lo	01
		Sub-index		01
		Starting Address	Hi	00
			Lo	00
		Number of data values	Hi	00
			Lo	04
ADU		CRC-16		93
				BE

Reading cycle counter – response

Description				Value
ADU		Address		01
PDU		Function Code (encapsulated interface)		2B
		MEI Type		0D
	CAN CiA DS309	Protocol Option Fields	Protocol Control	00
			Reserved Field	00
		Node ID		01
		Index	Hi	21
			Lo	01
		Sub-index		01
		Starting Address	Hi	00
			Lo	00
		Number of data values	Hi	00
			Lo	04
		Data Values (0x00000065 = 101 cycles)	Byte 1 (LSB)	65
			Byte 2	00
			Byte 3	00
			Byte 4 (MSB)	00
ADU		CRC-16		53
				AC

Table 12: Example "Reading cycle counter", request and response

Setting programme mode – request

Meaning				Value
ADU		Address		01
PDU		Function Code (encapsulated interface)		2B
		MEI Type		0D
	CAN CiA DS309	Protocol Option Fields	Protocol Control	01
			Reserved Field	00
		Node ID		01
		Index	Hi	21
			Lo	04
		Sub-index		01
		Starting Address	Hi	00
			Lo	00
		Number of data values	Hi	00
			Lo	01
		New Value		05
ADU		CRC-16		6C
				C2

Setting programme mode – response

Description				Value
ADU		Address		01
PDU		Function Code (encapsulated interface)		2B
		MEI Type		0D
	CAN CiA DS309	Protocol Option Fields	Protocol Control	01
			Reserved Field	00
		Node ID		01
		Index	Hi	21
			Lo	04
		Sub-index		01
		Starting Address	Hi	00
			Lo	00
		Number of data values	Hi	00
			Lo	00
ADU		CRC-16		C3
				ED

Table 13: Example "Setting programme mode", request and response

Reading device name module 1 – request

Meaning				Value
ADU		Address		01
PDU		Function Code (encapsulated interface)		2B
		MEI Type		0D
	CAN CiA DS309	Protocol Option Fields	Protocol Control	02
			Reserved Field	00
			Encoded Data	50
		Node ID		01
		Index	Hi	10
			Lo	08
		Sub-index		00
		Starting Address	Hi	00
			Lo	00
		Number of data values	Hi	00
			Lo	40
ADU		CRC-16		04
				F6

Reading device name module 1 – response

Description				Value
ADU		Address		01
PDU		Function Code (encapsulated interface)		2B
		MEI Type		0D
	CAN CiA DS309	Protocol Option Fields	Protocol Control	02
			Reserved Field	00
			Encoded Data	50
		Node ID		01
		Index	Hi	10
			Lo	08
		Sub-index		00
		Starting Address	Hi	00
			Lo	00
		Number of data values	Hi	00
			Lo	40
		Data	Char 1	4C ('L')
		Data	Char 2	6F ('o')
		Data	Char 3	67 ('g')
		Data	Char 4	69 ('i')
		Data	Char 5	63 ('c')
		Data	Char 6	20 (, ')
		Data	Char 7	43 ('C')
		Data	Char 8	6F ('o')
		Data	Char 9	6E ('n')
		Data	Char 10	74 ('t')
		Data	Char 11	72 ('r')
		Data	Char 12	6F ('o')
		Data	Char 13	6C ('l')
		Data	Char 14	6C ('l')
		Data	Char 15	65 ('e')
		Data	Char 16	72 ('r')
		Data	Chars 17 – 64	00
ADU		CRC-16		B6
				67

Table 14: Example "Reading device dame module 1", request and response

5 Commissioning

5.1 Procedure

We recommend the following procedure for initial commissioning:

1. Specify bus topology.
2. Perform wiring.
3. Unplug spring clip.
4. Switch on control unit.
5. Perform settings via menu.
   - Set bus type
   - Activate termination for the first and last bus subscriber.
   - Set the address.
   - Check and adjust the baudrate.
   - Activate BIAS network on demand.
6. Plug in spring clip.
7. Check communication.

5.2 Corrective action

Malfunction	Possible cause	Corrective action
RS485/422 module is not recognised.	The RS485/422 module is not plugged in correctly.	Check plug contacts. Plug in the RS485/422 module again.
	Firmware update not performed correctly.	Perform firmware update via the service module SM01.
	The RS485/422 module is only supported by the control units MGC-PRO.	Check label or type sign of the control unit.
Object access error	Object locked	

Table 15: Corrective action

5.3 Software tools

The following software tools can be helpful to support development:

Name	Manufacturer
Docklight Scripting	http://www.docklight.de/
ModbusDoctor	http://kikos31.developpez.com/modbusdoctor/
Modbus TK	http://code.google.com/p/modbus-tk/
Modbus Test GUI	Magnetic Autocontrol GmbH

Table 16: Software tools

6 Appendix

The description of the status words and object tables are available in document 5815,0000 "MicroDrive MGC/MGC-PRO Additional Information for System integrators".

7 List of abbreviations

Abbreviation	Meaning	Description
MGC	Magnetic Gate Controller	Control unit for the barriers MicroDrive MHTM™
CANopen	Controller Area Network	Fieldbus system
ADU	Application Data Unit	The complete MODBUS frame
PDU	Protocol Data Unit	Function code and data of the Modbus message
SDO	Service Data Object	CANopen communications object for parameterisation of object directory entries

Table 17: List of abbreviations

Index

MAGNETIC Autocontrol GmbH
Grienmatt 20
79650 Schopfheim
Germany

Tel.: +49 7622 695 5
Fax: +49 7622 695 602
email: info@ac-magnetic.com